Results: Pain VAS scores in patients with K/L 4 group were significantly increased in comparison to those in patients with K/L 2 and 3. The mean SDS score of all patients was 39.6 points and 127 of 250 patients with knee OA (50.8%) were complicated with depression. As the 50 patients with K/L 2 group (53.8%), 35 patients with K/L 3 group (44.3%) and 42 patients with K/L 4 group (53.8%) were complicated with depression, no significant difference for the prevalence of depression was observed between these three groups divided by the radiographic severities of knee OA (asymptotic p-value: 0.377). As mean SDS scores of each group were 39.9 points in K/L 2 group, 38.2 points in K/L 3 group and 40.8 points in K/L 4 group, no significant differences for the SDS scores were observed between these three groups. Pain-VAS score in the patients with depression (61.6 points) was significantly increased in comparison to that in those without depression (50.8 points) ($p < 0.001$).
Conclusion: The current study revealed that approximately half of the patients with knee OA were complicated with depression. While no significant differences for both the prevalence and severity of depression were observed between the patients divided by the radiographic severity of knee OA, pain severity in patients with depression was significantly increased in comparison to that in those without depression, suggesting that depression complicated with knee OA is associated with the symptoms rather than the severity of the disease.

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ONGOING PAIN FOLLOWING KNEE REPLACEMENT. SIMPLE CLINICAL TOOLS TO GUIDE ASSESSMENT OF VARYING PAIN PROFILES

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Purpose: Research has identified that approximately 20% of patients experience ongoing pain after knee replacement. Increasingly it is acknowledged that there is a complex interaction of multiple causative factors that contribute to a suboptimal outcome following knee replacement. It has been proposed that patients with ongoing pain can be characterised into one of a number of different pain profiles of common associative factors. This study aims to assess if distinct pain profiles can be determined and whether simple clinical tools can be used to guide a clinician to a possible profile.
Methods: A case controlled study comparing 100 patients with established ongoing pain following knee replacement to 200 pain free controls matched for age, gender, time from surgery and prosthesis was performed. Patients attended a research appointment and data was collected using self-report questionnaires and clinical assessment. Factors significantly and independently associated with ongoing pain were established from a case controlled binomial stepwise logistic regression analysis. These factors included proximal tibial tenderness, coronal plane instability, patellofemoral dysfunction, local allodynia and multiple other pain sites or pain diagnoses. Additional psychosocial factors were identified but excluded from this profiling study as they were deemed to influence pain regardless of other underlying associated factors and would be relevant in patients across all pain profiles. The 100 patients with ongoing pain were sub-grouped in multiple combinations based on presence or absence of 3 or 4 of the 5 factors found to be independently associated with ongoing pain. For determination of presence or absence of each of the 5 key associative factors in a given patient, a simple assessment tool was identified. The associative factor combination with the cleanest split of patients into different subgroupings was identified.
These groups were then compared, looking at a wide profile of assessed variables to determine if differences in the key associative factors led to more generalised differences in their overall profile. Comparison between subgroupings was made with one way ANOVA and Kruskall–Wallis Tests as appropriate.
Results: The combination of associative factors that gave the cleanest split of patients into different subgroupings was proximal tibial tenderness, coronal plane instability, local allodynia and multiple pain sites/ diagnoses. The simple assessment tool for each of these subgroupings was clinical palpation tenderness of the proximal tibia, coronal instability assessment in mid-flexion, brush allodynia assessment for local allodynia, and >3 additional either reported sites of pain or diagnoses of pain conditions. The spread of the 100 patients across these subgroups was: Pure Allodynia(18), Pure Tibial Tenderness(17), Pure Mid Flexion Coronal Instability(12), Pain Problem(19), Allodynia + Pain Problem(19), All of them(6), None of them(9).
Significant differences were identified between subgroupings for a wide spread of assessed variables suggesting that differences in key associative factors did indicate more generalised differences in their overall pain profile.
Conclusion: Patients with ongoing pain following knee replacement pose a challenge for the assessing clinician, in part due to the complex interaction of multiple associative factors, which have varying relative contributions to pain in any given patient. This study begins to provide evidence for and early characterisation of the varying pain profiles in these patients. In addition it has identified simple assessment tools, easily performed in a clinic setting, which could guide a treating clinician to a patient's profile. A knowledge of the profile of associative factors linked to a particular patient's pain could then in the future guide a clinician to the need for further investigations, management and prognosis.

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PRE-OPERATIVE EXPERIMENTAL THERMAL SENSITIVITY PREDICTS OXFORD KNEE SCORE 1-YEAR POST-OPERATIVELY: A PRELIMINARY STUDY

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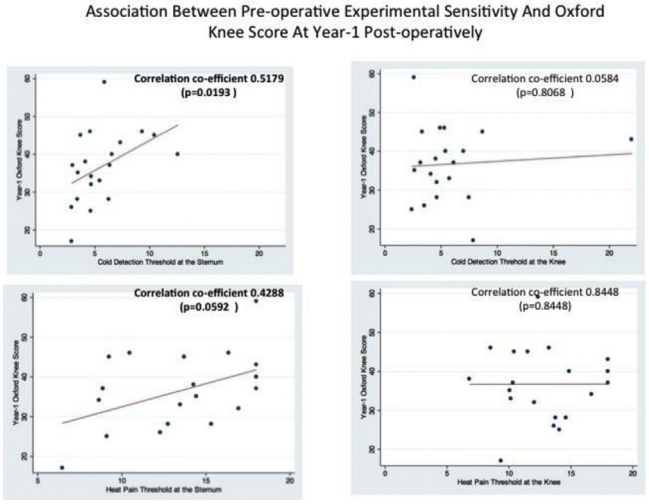
Purpose: Approximately 20% of patients undergoing knee replacement surgery experience ongoing symptoms a year after surgery. With rising rates of osteoarthritis of the knee and associated arthroplasty, identifying patients who may experience a poor outcome following surgery is essential to inform clinical care as these patients may benefit from additional therapies prior to surgery, or may choose not to proceed with surgery. Preliminary evidence has suggested that pre-operative widespread pain sensitisation measured using pressure algometry may be associated with chronic pain after surgery. This study aimed to further explore the predictive role of Quantitative Sensory Testing (QST), using thermal modalities, with respect to knee replacement surgery.
Methods: Patients listed for knee replacement surgery for osteoarthritis of the knee were recruited from an Orthopaedic outpatient knee clinic. QST was conducted at the time of the pre-operative assessment clinic appointment. The following thresholds were measured at the sternum (distant site) and affected knee (local site): warm detect threshold, heat pain threshold, cold detection threshold and cold pain threshold. Demographic data were also collected at baseline and patients were asked to complete the Oxford Knee Score (OKS). Follow-up OKS data were collected at year-1 following surgery. Spearman's Rank Correlation was used to investigate any associations between individual pre-operative thermal sensory tests and post-operative OKS.
Results: Baseline and year-1 follow-up data were available for 20 participants included in this study. Participants included 9 females and 11 males with a mean age of 73 (12). The mean baseline and Year-1 follow-up OKS were 17.5 (6.4) and 36.7 (9.5) respectively. Of all the modalities tested, only cold detection threshold measured at the sternum (not the knee) was significantly ($p = 0.019$) associated with post-operative Oxford Knee Score. A similar trend, which approached statistical significance, was seen with heat pain thresholds measured at the sternum, Figure 1.
Conclusions: This study adds to the emerging literature, which suggests that pre-operative experimental sensitivity may help to predict patient outcome following knee replacement surgery. The fact that measures taken at the sternum were predictors of post-operative outcome supports previous work showing that centrally mediated widespread pain sensitisation is present and an important predictive measure in this patient group. Although it might be expected that similar findings should also be seen at the affected site, this might not have been detected due to the effect of other peripherally mediated mechanisms. Further work is needed in larger patient groups so that the association can be tested with adjustment for potential confounding factors such as age, BMI and mood scores.



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RELATIONSHIP BETWEEN MUSCLE STRENGTH AND KNEE PAIN IN KNEE OSTEOARTHRITIS PATIENTS

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Purpose: Knee osteoarthritis is a motor disorder that leads to decreased QOL and physical function in old age, and is one cause of the need for nursing care. The prevention of knee osteoarthritis and amelioration of its symptoms are an urgent issue today with rapidly increasing elderly populations. The importance of knee muscle strength training in conservative treatment is well known, and it effects have been verified. To elucidate the relationship between muscle strength and pain symptoms, we investigated the relationship between muscle strength, measured with a knee extension and flexion strength measurement instrument we are currently developing, and knee pain in activities of daily living.
Methods: The subjects were 92 women (mean age 73.8 ± 8.6 years) with knee osteoarthritis who were being treated in the orthopedics department of our center, comprising 160 knees (right 75, left 85) that had not been treated surgically. Standing frontal X-ray images of the knee were evaluated and knee pain during activities of daily living (level ground walking, stair climbing, lying down, standing up, and sitting on floor with legs folded underneath the body) was surveyed with a questionnaire. Knee extension and flexion strength was measured using a prototype measuring instrument developed jointly with the Department of Gerontechnology at our center. The knee extension and flexion measuring instrument can be transported on a cart, and uses an Imada Co., Ltd. force gauge for measuring the precision of industrial products. With subjects in a sitting position with legs flexed 90° and a strap on the ankle joint, knee extension and flexion strength were measured isometrically for 3 seconds. Knee flexion strength and extension strength were measured two times each in the left and right legs and the better value for each side was utilized. Knee extension and flexion strength were expressed as the proportion to body weight, and the difference of the two, (extension strength/weight) minus (flexion strength/weight), was also calculated. The correlation between those indices and the knee pain score during activities of daily living was investigated.
Results: In the right knee, significant correlations were seen between knee extension strength/weight and the scores for knee pain during level ground walking, stair climbing, and sitting on the floor with legs underneath the body (walking, stair climbing $p < 0.01$, sitting on the floor with legs underneath $p < 0.05$). In the left knee, significant correlations were seen between knee extension strength/weight and knee pain scores during level ground walking, stair climbing, standing up, and sitting on the floor with legs underneath the body (walking, standing up, sitting on the floor with legs underneath $p < 0.01$, stair climbing $p < 0.05$). Knee flexion strength/weight was found to be significantly correlated with knee pain during level ground walking in the right knee ($p < 0.05$). The correlation with the knee pain score and the difference between extension strength/weight and flexion strength/weight were significant in all activities in the right knee (walking, stair climbing $p < 0.01$, others $p < 0.05$), while in the left knee these values were significant during walking, standing up, and sitting on the floor with legs underneath (standing up $p < 0.01$, walking, sitting on the floor with legs underneath $p<0.05$).
Conclusions: In knee osteoarthritis patients, knee pain during activities of daily living increases with decreases in knee extension strength in both left and right legs. Differences were seen between right and left in the activities in which a relation between muscle strength and knee pain appeared. Investigations that consider leg strength in proportion to weight or include flexion strength are considered to be useful.

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EFFICACY OF PERIARTICULAR MULTIMODAL DRUG INJECTION IN TOTAL KNEE ARTHROPLASTY FOR PAIN MANAGEMENT AND REHABILITATION

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Purpose: Recently many authors have reported on the benefits of using multimodal drug injections in total knee arthroplasty (TKA) which assist pain relief in the early post-operative stages. This study aims to clarify the effects of periarticular multimodal drug injection on postoperative pain, nausea, rehabilitation, and period of hospitalization.
Methods: From August 2012, we performed 66 consecutive TKA operations over a one year period. From this sample group, we excluded those patients with rheumatoid arthritis and revision surgery to leave a total of 48 knees for detailed analysis of which 5 were male and 43 were female. All patients had been diagnosed with osteoarthritis and both general anesthesia and epidural anesthesia were administered to each patient prior to the surgery. Patients were then divided into three groups which administered multimodal injections in a mixture including ropivacaine: one including 10 mg of morphine, another 5 mg of morphine, and the third including PSS. There were 18 knees in the group including 10 mg of morphine (M10), 13 in the group with 5 mg of morphine (M5) and 17 in the PSS control group (P). Data was collected on how many times a patient took a painkiller, how many times they took an anti-nausea drug, the degrees of flexion angle of the knee after 7 days, how many days it took to walk with a T-cane, how many days it took to climb stairs, and the total period of hospital stay. For comparison of the clinical results between the groups, the Mann–Whitney *U* test was used. Statistical significance was set at $p < 0.05$.
Results: The findings show a significant difference between M10 and M5 groups and the P group in terms of how many painkillers were taken. However, there was little difference between the M10 and M5 groups. There was no significant difference between the three groups in terms of how many anti-nausea drugs were taken. The M10 group had a deeper flexion than the P group, though the differences between the M10 and M5, and M5 and P group were not significant. There was no significant difference between the 3 groups regarding either the time taken to walk with a walking stick, or the time taken to walk up and down stairs. In terms of hospital stay, M10 showed a significantly